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gentlemen have already been mentioned in several connections; but Mr. Common especially has given a great deal of time and attention to the numerous matters connected with the expeditions; and this kindly assistance will have contributed in no small degree to any success which the expeditions may meet with.

10. The following details as to other stations and observers may be of interest:—

(1) Mr. G. C. Bruce, the meteorological officer at St. Helena, wrote to the Astronomer-Royal, offering, on behalf of His Excellency the Governor, every assistance to any expedition which might be sent out. He was informed that the central line passed about 2° 50′ N. of St. Helena, and that station was not therefore to be occupied.

(2) Professor Holden, of the Lick Observatory, wrote informing the Secretary of the Society that two of his assistants were to proceed to some point in South America for observation of the eclipse, and asking for information as to the movements of our observers. He was informed by the Secretary of this Committee of the general plans of operation, as far as they were then developed.

(3) Mr. J. P. Smith has made inquiries about the voyage to Cayenne, and was referred to the Rev. S. J. Perry.

(4) Information has been received that Miss E. Brown and Miss Jefferies are proceeding to Trinidad to observe the eclipse.

(5) From *Nature*, for 1889, Sept. 12, we learn that the Navy Department in Washington is fitting out an expedition to Muxima, in Angola, about one hundred miles in the interior up the Coanza river. The party will be a large one, under the direction of Professor D. P. Todd, and will remain some time at the station.

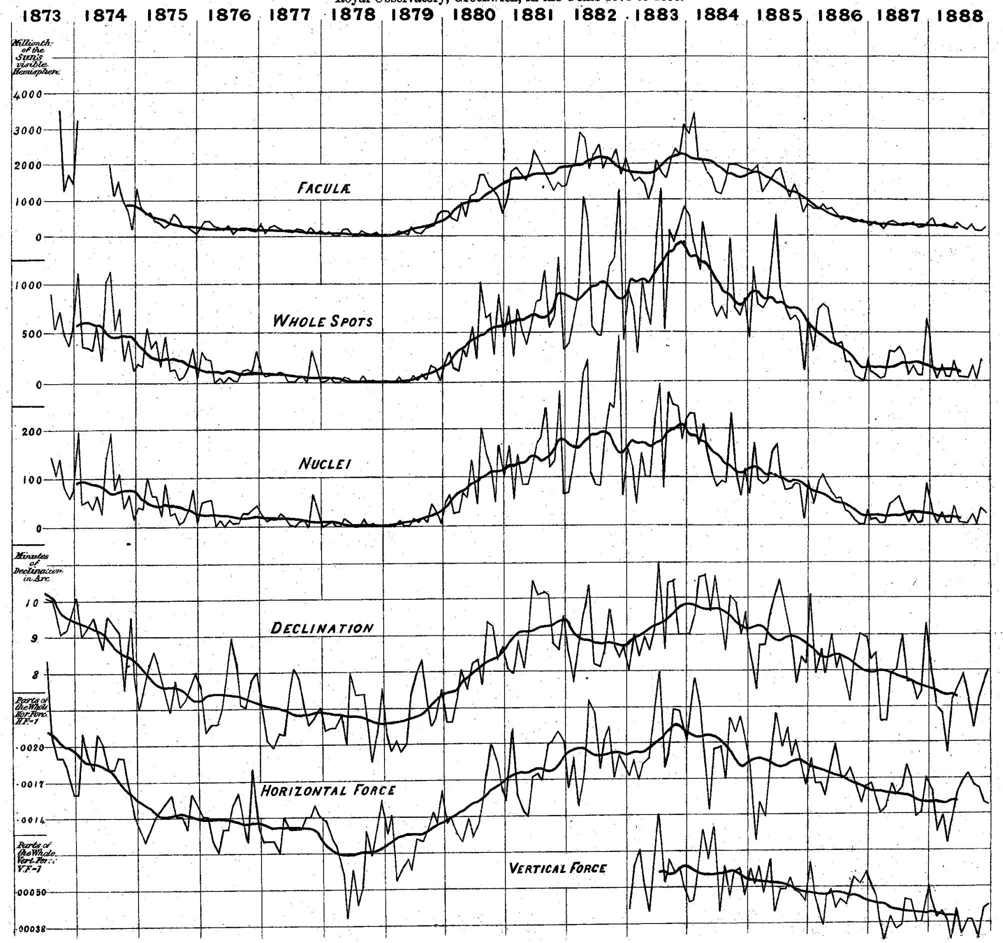
(6) Professor Tacchini has applied to the Committee for leave to join the Rev. S. J. Perry in his expedition to the Salut Isles. [October 18. Professor Tacchini has unfortunately been prevented from joining the expedition.]

Areas of Faculæ and Sun-spots, compared with Diurnal Ranges of Magnetic Declination, Horizontal Force, and Vertical Force, as observed at the Royal Observatory, Greenwich, in the Years 1873 to 1888.

(*Communicated by the Astronomer Royal.*)

The three upper curves of Plate I., representing the areas of faculæ, whole spots, and umbræ respectively, exhibit in a graphical form the results given on pages 106, 107, and 108 of

Areas of Faculæ, Whole Spots, and Nuclei, compared with Diurnal Ranges of Magnetic Declination, Horizontal Force, and Vertical Force, as observed at the Royal Observatory, Greenwich, in the Years 1873 to 1888.



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the *Greenwich Spectroscopic and Photographic Results* for 1884, and in similar tables in the volumes for the succeeding years. The mean areas for each of the three orders of solar markings have been formed by taking the means of the areas as measured upon the solar photographs, corrected for foreshortening, and reduced to millionths of the Sun's visible hemisphere, for each day of observation throughout each synodic rotation of the Sun. The commencement of each rotation is defined by the coincidence of the assumed prime meridian with the central meridian, the assumed prime meridian being that meridian which passed through the ascending node at mean noon on 1854, January 1, and the assumed period of the Sun's sidereal rotation being 25·38 days.

The ordinates for the three curves represent, therefore, the mean daily areas for each synodic rotation expressed in millionths of the Sun's visible hemisphere. The scale on which the ordinates have been drawn is five times as large for the nuclei as for the whole spots, and three and one-third times as large for the whole spots as for the faculæ, in order that the variations in each curve might be equally distinct; for the areas of the whole spots are, on the average, about five times as great as those of the nuclei, and of the faculæ about three times as large as of the whole spots. A smooth curve has also been drawn for each of the three orders of phenomena, the ordinates for which correspond at any given rotation to the mean of the areas for thirteen rotations, or of a year very nearly, i.e. the mean of the areas for the rotation in question, for the six rotations immediately preceding it, and for the six immediately following it.

From 1873 to the end of 1881 only the photographs taken at the Royal Observatory, Greenwich, were available for measurement, but from 1881 December 21 the gaps in the Greenwich series have been filled as far as possible by photographs taken at Dehra Dûn, India; and from the beginning of 1885 by photographs taken at the Royal Alfred Observatory, Mauritius, as well. The daily record for the years 1882 to 1888 may, therefore, be considered as practically complete.

In explanation of the construction of the magnetic curves it may be mentioned that the annual volumes of Greenwich observations contain tables, giving for each of the magnetic elements of declination, horizontal force, and vertical force, its mean value at each hour in every month. The difference between the greatest and least of these hourly values in every month is the monthly diurnal range. The values for vertical force are not available until the year 1883, in consequence of difficulty with the temperature correction. The results, both for horizontal force and for vertical force, are corrected for temperature. Now the magnetic diurnal ranges are subject to an annual period, being greatest in summer and least in winter, the period being one which, depending on geographical position, has not necessarily any counterpart in the solar spot variation, and which,

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therefore, should be eliminated in order to make comparison with the Sun-spot curves. The mean monthly value of diurnal range having been found from the results for the years 1841 to 1877 for declination and horizontal force, and from the results for 1883 to 1888 for vertical force, the differences in each case between the several mean monthly values and the mean yearly value give corrections which, applied to the monthly values for any individual year, clear out the average annual inequality, leaving only the accidental irregularity remaining. In this way the irregular-looking curves of diurnal range of magnetic declination, horizontal force, and vertical force given in the plate are found.

The smoothed curves are formed as follows:—Assuming equality in the length of the several calendar months in each element, the mean of the first twelve values is taken, then the mean of the second to the thirteenth value, the mean of the third to the fourteenth value, and so on. Finally, the mean of each adjacent pair of the means so formed is taken, from which resulting values the smoothed curve is formed.

The declination range is given in angular measure, and those of horizontal force and vertical force in parts of the whole horizontal and vertical forces respectively, the scales being so arranged that equal changes of absolute magnetic force are represented by an equal length of ordinate. 1′ of declination corresponds to ·0003 of horizontal force, and to $\frac{\cdot 0003}{\tan \text{dip}} = \cdot 00012$ of vertical force, the values adopted in setting out the various scales.

Royal Observatory, Greenwich:
1889 *November* 8.

Mean Daily Area of Sun-spots for each Degree of Solar Latitude for each Year from 1874 *to* 1888, *as measured on Photographs at the Royal Observatory, Greenwich.*

(*Communicated by the Astronomer Royal.*)

The diagram on Plate II. has been laid down in the following manner. The total areas of whole spots as expressed in millionths of the Sun's visible hemisphere have been taken out for each degree of solar latitude for each year, and divided by the number of days of observation, to give the mean daily area. In apportioning the different spots to their respective latitudes the following rule has been observed. If the heliographic latitude of the centre of any single spot, or group of spots when measured as one, showed °·5 or any higher figure in the decimal place, the entire area of the spot was taken as belonging to the next higher whole degree of latitude. If it showed °·4 or any